



## Original Communication

## Study of fingerprint classification and their gender distribution among South Indian population

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## ABSTRACT

Identification of an individual plays a vital part of any medicolegal investigation. Fingerprint is considered to be the most accurate and reliable indicator in identification.

The present study was conducted on 500 South Indian subjects to determine the individuality and the predominant fingerprint pattern among South Indian population. Two-hundred and fifty males and 250 females of South Indian origin were included for this study and rolled prints were taken from all the 10 digits and the same were stored on a proforma.

The most frequent fingerprint pattern was ulnar loop in the total population, as well as in the sex wise distribution.

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## 1. Introduction

Study of fingerprints as methods of identification is also known as Dactylography or Dactyloscopy, and at present it is also known as Henry–Galton system of identification. Dactylography is the process of taking the impressions of papillary ridges of the fingertips for the purpose of identification of a person. Identification by this method is absolute, without any chance of error.<sup>1</sup>

Identification means determination of individuality of a person. It may be complete (absolute) or incomplete (partial). Complete identification means the absolute fixation of a person. Partial identification implies ascertainment of only small facts about the identity while others still remain unknown. The most successful approach utilises a combination of more than one method.<sup>2</sup>

Some of the following points are usually noted for the purpose of identification like race, sex, age, complexion and features, hair, footprints, deformities, tattoo marks, scars, occupational marks, handwriting, clothes and personal articles, speech and voice, gait, memory, education and DNA profile, etc., out of which fingerprint system is the best and it has been estimated that chances of two persons having identical finger impressions is about one in sixty four thousand million population of the world.<sup>3</sup> Identical twins,

originating from one fertilized egg, are arguably the most alike of any beings on earth. They share the same DNA profile because they began existence as one entity, yet their fingerprints are as distinctive as any unrelated persons.<sup>4</sup>

## 2. Aims and objectives

The aims and objectives of this study are as follows:

1. To determine the predominant fingerprint pattern among South Indian population.
2. To determine the possibility of gender distribution in finger prints.

## 3. Materials and methods

The present study was conducted in the department of Forensic Medicine and Toxicology, J.S.S. Medical College, Mysore, India, amongst 500 South Indians. Total sample constituted of 250 males and 250 females. Non-resident Indians and subjects from Central, Western and Eastern India were excluded from the study. Subjects with any evidence of disease and injury of the fingertips that was likely to alter the fingerprint pattern (leprosy, scars of the fingertips, lacerations) were excluded. Informed written consent was obtained prior to taking the prints (see Figs. 1 and 2).

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The digits were numbered as per Henry's classification system.<sup>5</sup>

	L Little	L Ring	L Middle	L Index	L Thumb	R Thumb	R Index	R Middle	R Ring	R Little
Finger number	10	9	8	7	6	1	2	3	4	5

#### 4. Procedure

The subject was asked to wash and dry their hands to remove dirt and grease.

The subject was asked to keep his/her arm relaxed and not to try to help in rolling the fingers as this may cause smudging. Then the finger bulbs were rolled on the Printake strip – and bilateral rolled finger ball prints of 500 South Indians (250 females and

250 males) were collected. The thumb and the fingers are always rolled away from the body of the person who is being printed. This starts the motion with the elbow slightly lifted, and the arm more or less tensed in supporting its weight, and concludes the movements with the arm and fingers relaxed.<sup>6</sup> The rolled impressions of each finger were obtained in the allotted space for that finger on the proforma. In this way for each and every individual the entire prints of 10 fingers were prepared. Only rolled prints were taken i.e. no plain prints.

A single Printake strip was used for 10–12 subjects.

#### 5. Statistical analysis

The data obtained was analysed statistically using SPSS (Statistical Programme for Social Sciences, version 10.0) computer software package.

*t*-test was performed to test the significance and *p*-value < 0.05 was considered as significant.

#### 6. Discussion

In the present study the ulnar loop was the most frequently observed pattern followed by whorl in the total subject population of 250 females and 250 males in all the 10 digits. In females 55.28% of ulnar loop pattern was observed against a 26.84% of the whorl pattern, and in males 49.32% of ulnar loop pattern was observed against a 30.64% of the whorl pattern.

It was also observed that in the total subject population the whorl pattern was significantly higher in both the ring fingers than that of the loop pattern, i.e., 45.8% of the whorl pattern against a 42.4% of loop pattern in females and 56.2% of the whorl pattern against 30.2% of loop pattern in males. The frequency of ulnar loop pattern was higher in females than that of male population and the frequency of whorl pattern in ring fingers were more in males than female population (see Tables 1 and 2).

The least frequently observed pattern in the total population were simple arches, tented arches, loops (radial), twinned loops and accidental types in that order.

Igbigbi and Msamati in their study on indigenous black Zimbabweans, they found that ulnar loops were the most predominant digital pattern type in most sexes, followed by whorls in males and arches in females.<sup>7</sup>

Gangadhar and Rajashekara Reddy in their study on 360 unrelated Adikarnataka population of Mysore city of Karnataka State, found that the frequency of loop patterns (57.11%) were common followed by whorls (27.89%) and arches (15.00%). Thus the overall order of patterns types is L > W > A. This trend was observed in both males and females. Among the loop patterns the ulnar loops (53.89%) were common than that of the radial loops (3.22%).<sup>8</sup>

Purkait in her comparative study on frequency of fingerprint patterns and variation in the 10 digit classification on males (454 samples – 227 from each tribe) of Mundas and Lodhas, a tribal group of Midnapur district in West Bengal where Mundas exhibit higher frequency of whorl and loop patterns while loops are more frequent among Lodhas.<sup>9</sup>

Jaga and Igbigbi in their study on 390 Ijaw subjects of Southern Nigerians, found that the most prevalent digital ridge pattern type

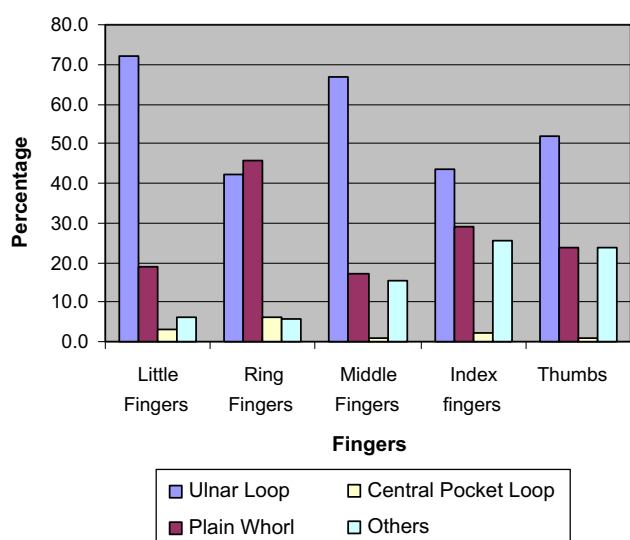


Fig. 1. Finger print patterns in females.

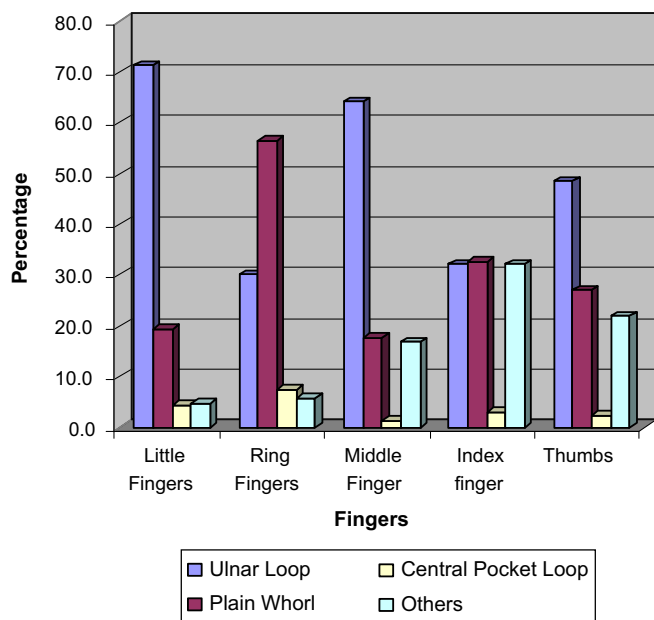


Fig. 2. Finger print patterns in males.

**Table 1**

Finger print patterns in females.

Patterns	Little fingers (digits 10 and 5)		Ring fingers (digits 9 and 4)		Middle fingers (digits 8 and 3)		Index fingers (digits 7 and 2)		Thumbs (digits 6 and 1)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Loop (ulnar)	360	72.0	212	42.4	334	66.8	217	43.4	259	51.8
Plain whorl	94	18.8	229	45.8	85	17	144	28.8	119	23.8
Central pocket loop	16	3.2	31	6.2	4	0.8	12	2.4	4	0.8
Tented arch	9	1.8	10	2	29	5.8	31	6.2	3	0.6
Exceptional arch	14	2.8	10	2	15	3	17	3.4	3	0.6
Loop (radial)	1	0.2	4	0.8	1	0.2	25	5	3	0.6
Simple arch	2	0.4	1	0.2	12	2.4	30	6	14	2.8
Twinned loop	3	0.6	3	0.6	19	3.8	19	3.8	93	18.6
Accidental	1	0.2	0	0	1	0.2	5	1	2	0.4
All patterns	500	100	500	100	500	100	500	100	500	100

**Table 2**

Finger print patterns in males.

Patterns	Little fingers (digits 10 and 5)		Ring fingers (digits 9 and 4)		Middle fingers (digits 8 and 3)		Index fingers (digits 7 and 2)		Thumbs (digits 6 and 1)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Loop (ulnar)	357	71.4	151	30.2	321	64.2	161	32.2	243	48.6
Plain whorl	97	19.4	283	56.6	88	17.6	163	32.6	135	27
Central pocket loop	22	4.4	37	7.4	7	1.4	15	3	12	2.4
Tented arch	6	1.2	6	1.2	13	2.6	24	4.8	3	0.6
Exceptional arch	7	1.4	9	1.8	11	2.2	14	2.8	5	1
Loop (radial)	1	0.2	0	0	2	0.4	48	9.6	1	0.2
Simple arch	2	0.4	7	1.4	23	4.6	41	8.2	17	3.4
Twinned loop	5	1.0	6	1.2	32	6.4	30	6	83	16.6
Accidental	3	0.6	1	0.2	3	0.6	4	0.8	1	0.2
All patterns	500	100	500	100	500	100	500	100	500	100

was ulnar loop followed by whorls, arches and the least prevalent was radial loops. Gender dimorphism was not observed with digital ridge pattern types.<sup>10</sup>

Igbigbi and Msamati in their study on Kenyan and Tanzanian subjects showed that the ulnar loops were the most prevalent digital ridge pattern and the arches were the least.<sup>11</sup>

A study conducted by Qutub, Qazi, Mapa and Woods on 100 male and 100 female Black Americans showed significant bimanual asymmetry for patterns in the second and third interdigital areas of palms. The significant sex differences included excess of digital arch patterns in females and higher mean finger ridge counts in males.<sup>12</sup>

Ching Cho in his study on 100 New Zealand Samoan males and 93 females observed that the whorls (55.6%) were more abundant than loops (43.6%) in males and females exhibited a much higher frequency of whorls (65.6%) and lower frequency of ulnar loops (33.7%).<sup>13</sup>

## 7. Conclusion

The following conclusions were drawn based on the study of finger prints:

1. The most frequent pattern among South Indian population is loop (ulnar).
2. Irrespective of the sexes the pattern did not show any difference.

## Conflict of Interest

I am employed as Assistant Professor in J.S.S. Medical College, Mysore-15, Karnataka, India, and no source of support were taken in the form of grants/funding.

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## Ethical Approval

None declared.

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